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Our Case No. 659/764  
K-C Ref. No. 14,645

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*5-6-03*

# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Gary L. Shanklin et al.

Serial No. 09/753,136

Filing Date: December 29, 2000

For ANTI-VIRAL LOTION TISSUE,  
AND METHODS FOR MAKING  
AND USING THE SAME

Examiner Sharon L. Howard

Group Art Unit No. 1615

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## APPELLANTS' BRIEF

Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

This is an appeal from the Final Rejection dated October 2, 2002, of Claims 1-7, 10-20, and 23-30, all the claims pending herein.

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**(1) REAL PARTY IN INTEREST**

The present application is owned by Kimberly-Clark Worldwide, Inc.

**(2) RELATED APPEALS AND INTERFERENCES**

There are no known appeals or interferences, which will directly affect or be directly affected by or have a bearing on this appeal.

**(3) STATUS OF CLAIMS**

Claims 1-7, 10-20, and 23-30 are pending herein, and all are appealed.

**(4) STATUS OF AMENDMENTS**

The pending claims have not been amended, but have been subjected to restriction and/or election. The first Office Action, mailed March 13, 2002, indicates that Appellants' representatives made an election of claims over the telephone, electing claims 1-31 for prosecution on the merits and allowing claims 32-35 to be withdrawn from consideration [Paper No. 5, p. 3]. This Office Action further required an election of species within claims 1-31. In the Response To Office Action filed July 11, 2002, Appellants confirmed the election of claims 1-31 and further elected the species reciting "hydroxyl-functional polyester diols" [Paper No. 6, pp.1-2]. Thus, the claims under appeal are 1-7, 10-20, and 23-30, and these claims are in their original form. A copy of the claims is attached as Appendix A.

**(5) SUMMARY OF INVENTION**

In an embodiment of the invention, there is provided a non-irritating anti-viral lotioned tissue product having applied to at least one surface thereof (p. 10, lines 4-8) an anti-viral lotion composition comprising a virucidal effective amount of at least one

anti-viral organic acid (p. 4, line 18 – p. 5, line 9); and a topical delivery system including at least one polyester (p. 5, lines 10-28).

In another embodiment of the invention, there is provided a lotioned tissue product having applied to at least one surface thereof (p. 10, lines 4-8) an anti-viral lotion composition comprising about 1% to about 25% of at least one anti-viral organic acid (p. 5, lines 1-2); about 5% to about 25% of an emollient including at least one polyester (p. 5, lines 10-28); and a cationic surfactant (p. 6, lines 1-17).

In yet another embodiment of the invention, there is provided a non-irritating, anti-viral lotion composition comprising a virucidal effective amount of at least one anti-viral organic acid (p. 4, line 18 – p. 5, line 9); and a topical delivery system including at least one polyester (p. 5, lines 10-28).

In yet another embodiment of the invention, there is provided an anti-viral lotion composition comprising about 1% to about 25% of at least one anti-viral organic acid (p. 5, lines 1-2); about 5% to about 25% of an emollient including at least one polyester (p. 5, lines 10-28); and a cationic surfactant (p. 6, lines 1-17).

In yet another embodiment of the invention, there is provided a method of inhibiting the transfer of a viral infection comprising providing anti-viral lotion tissue product having applied to at least one surface thereof an anti-viral lotion composition (p. 10, lines 4-8) comprising a virucidal effective amount of at least one anti-viral organic acid (p. 4, line 18 – p. 5, line 9) and a topical delivery system including at least one polyester (p. 5, lines 10-28); contacting a fluid containing at least one virus with said anti-viral tissue product (p. 4, lines 3-4); and absorbing said fluid within said absorbent article to contact the fluid with said anti-viral lotion composition (p. 4, lines 4-5).

## **(6) ISSUE**

- 1. Whether Claims 1-7, 10-20 and 23-30 are obvious under 35 USC § 103 over U.S. Patent No. 5,871,763 to Luu et al. in view of U.S. Patent No. 5,705,164 to Mackey et al.**

## **(7) GROUPING OF CLAIMS**

For the purposes of this appeal the claims stand or fall together.<sup>1</sup>

## **(8) ARGUMENT**

### **1. Description of the present invention**

Appellants have developed an anti-viral lotion that is effective at killing viruses, yet allows less irritation to a user's skin than conventional lotions containing anti-viral agents. It has been discovered that the combination of an anti-viral effective amount of one or more anti-viral organic acids can be combined with an emollient or topical delivery system including at least one polyester. This topical delivery system allows the incorporation of the anti-viral organic acids into the lotion formulation, controls their delivery, and maintains them in the stratum corneum. This reduces the amount of anti-viral organic acid necessary for efficacy, and thereby reduces the potential for irritation. The anti-viral lotion can be applied to one or more surfaces of a tissue product to provide an anti-viral lotion tissue. The anti-viral lotion tissue can be used to prevent the spread of a viral infection by contacting the tissue product to a body part, such that a fluid containing at least one virus, such as a nasal discharge, is absorbed into the tissue.

### **2. Claims 1-7, 10-20 and 23-30 are not obvious over U.S. Patent No. 5,871,763 to Luu et al. in view of U.S. Patent No. 5,705,164 to Mackey et al.**

The claims at issue stand rejected as obvious over U.S. Patent No. 5,871,763 to Luu et al. ("Luu"), in view of U.S. Patent No. 5,705,164 to Mackey et al. ("Mackey"). The Examiner asserts that the lotion containing organic acids as described in Luu can be combined with the lotion and lotioned tissue as described in Mackey, and that this combination is equivalent to the tissue product and lotion as claimed by Appellants.

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<sup>1</sup> It is noted for the record, however, that, separate from the issues in this appeal, independent claims 1, 11, 14, 25 and 28 are all mutually distinct, since each claim contains a combination of claim elements not found in the other independent claims.

The Examiner has not specifically stated how the combination of Luu and Mackey would provide for the method of inhibiting the transfer of a viral infection as claimed by Appellants; however, the claims directed to this method were included in the rejection.

Appellants respectfully point out that the Examiner has not established a *prima facie* case of obviousness under 35 U.S.C. § 103 as a basis for rejection of these claims. In MPEP § 2143, the three basic elements of a valid *prima facie* case of obviousness in view of a reference are presented as:

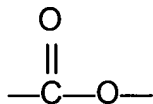
- 1) Some suggestion or motivation to modify the reference or to combine reference teachings;
- 2) A reasonable expectation of success in the modification or combination; and
- 3) A teaching or suggestion of all the claim elements in the reference(s).

The applied references, alone or in combination, do not teach or suggest each and every element of Appellants' claims. Moreover, there is no suggestion or motivation to combine the teachings to provide a tissue product, a lotion, or a method as claimed by Appellants.

**A. Lack of teaching or suggestion of each and every element of the claims.**

The combination of Luu and Mackey fails to provide each and every element of Appellants' claims. Specifically, the references do not teach or suggest a topical delivery system or an emollient including at least one polyester. The McGraw-Hill Encyclopedia Of Science & Technology, 9<sup>th</sup> Edition, defines polyesters as:

... polymeric materials in which ester groups,



are in the main chains.

[Manson, J.A. "Polyester resins" in McGraw-Hill Encyclopedia Of Science & Technology, 9<sup>th</sup> Edition, New York: McGraw-Hill., 2002, p. 152]

A copy of the reference containing this definition is attached as Appendix B. This standard definition of polyesters is consistent with the disclosure in Appellants' specification, which states that:

The topical delivery systems of the present invention comprise one or more polyesters. The polyesters of the present invention can be made from repeating monomeric units, as well as dimers, trimers, or tetramers.

[p. 5, lines 16-18; emphasis added]

In preferred embodiments, the ends of the polyester chains contain hydroxyl groups (-OH; "hydroxyl-functional polyester diols") or fatty alkyl groups ("fatty alkyl capped complex polyesters"). The specification further provides specific examples of polyesters containing ester groups in the main chains, including trimethylpentanediol / adipic acid copolymer and trimethylpentanediol / adipic isononanoic acid copolymer.

The Examiner has recognized that Luu does not teach or suggest a topical delivery system or an emollient containing at least one polyester [Paper No. 5, p. 7, line 6]. However, the Examiner has asserted that Mackey discloses a liquid polyol polyester emollient [Paper No. 5, p. 7, lines 7-9]. Appellants respectfully point out that the "liquid polyol polyesters" of Mackey are not polyesters according to the standard definition. Mackey specifically defines a "polyol polyester" as a polyol having some or all of its free alcohol groups (-OH) reacted to form ester groups [col. 9, lines 1-9 and 20-31]. The polyols from which these polyol polyesters are derived are saccharides, glycerols, and alcohol-functional polymers, none of which contain ester groups in the main chain [col. 8, lines 57-67]. The esterification of the alcohol groups only provides ester groups pendant to the main chain, not incorporated into the main chain. Moreover, the solid polyol polyesters disclosed in Mackey also do not appear to contain ester groups in the main chain, but rather are simply derivatives of the liquid polyol polyesters that have been reacted to form chains or networks [col. 12, line 28 – col. 13, line 23].

Neither Luu nor Mackey teaches or suggests a polyester as claimed by Appellants. Luu discloses a variety of emollients and other ingredients for a lotion, but does not teach or suggest a polyester. Mackey discloses emollients containing substances having ester groups, but does not teach or suggest a true polyester. Thus,

the combination of Luu and Mackey, even if proper, fails to provide each and every element of the claims.

**B. Lack of suggestion or motivation to combine the references.**

The Examiner also has not provided any suggestion or motivation to combine the disclosures of Luu and Mackey to provide a tissue product, a lotion, or a method as claimed by Appellants. The arguments for obviousness rely solely on the assertion that the individual elements of the claims are disclosed in the references [Paper No. 5, p. 7, lines 13-16]. However, the Examiner has not provided any evidence of a suggestion to combine the non-greasy lotion of Luu with the polyol polyesters disclosed in Mackey, nor of any motivation to carry out such a combination.

This lack of suggestion or motivation to combine the references was addressed by Appellants in the Response to Office Action filed July 11, 2002 [Paper No. 6]. The primary objective of Luu is to provide a lotion that has a "non-greasy feeling." [col. 3, lines 48-51]. This is accomplished by preparing the lotion from relatively higher melting point components that are *solids* on the tissue product, which then melt upon contact with body heat to facilitate the transfer of the lotion to the surface of the user's skin. Furthermore, Luu preferably uses a lotion that has a relatively high melting point such that the lotion may *resolidify* on the skin [col. 3, lines 61-65] and teaches that lotions that have an onset of melting up to 28°C have the perception of a greasy feel, whereas those that begin to melt only at 31°C to 36°C have a non-greasy feel [col. 16, lines 50-59]. In stark contrast, Mackey is drawn to a lotion having a *liquid* polyol polyester. The lotions of Mackey preferably are semisolids and exhibit fluid-like rheology fluid properties at temperatures only of 20°C [col. 8, lines 26-32]. Accordingly, the liquid polyol polyesters of Mackey are exactly the type of component that Luu is trying to avoid. Moreover, the combination suggested by the Examiner - the substitution of the liquid polyol polyester of Mackey for the non-greasy, high melting point lotion of Luu - would destroy the intended function of the lotion of Luu.

The Examiner has responded to Appellants' arguments simply by restating the original rejection and rationale, without providing any evidence of a suggestion or motivation to combine the references [Paper No. 8]. Beyond a listing of the asserted teachings of each reference, the Final Office Action only states that:

In essence, the rejection is therefore maintained for reasons set forth above. [Paper No. 8, p. 3, lines 3-4]

The text before this statement in the Final Office Action contains no stated reasons, and Appellants thus have looked again to the first Office Action for the official reasons for combining the references. The only reasoning set forth in the first Office Action is that:

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the composition of Luu to include the teachings of a polyester by Mackey, because Mackey teaches tissue paper treated with a lotion composition. [Paper No. 5, p. 7, lines 13-16]

Applicants respectfully point out that this conclusory statement regarding obviousness or regarding a suggestion or motivation to combine or modify references is insufficient to establish a *prima facie* case of obviousness.

As noted in MPEP § 2143.01, with reference to *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993):

A statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is **not sufficient** to establish a *prima facie* case of obviousness without some **objective reason to combine** the teachings of the references. [Bold emphasis added]

This principle has been upheld in recent decisions of the U.S. Court of Appeals for the Federal Circuit. In the decision of *In re Dembiczak*, 50 USPQ2d 1614, 1618 (Fed. Cir. 1999), the court reversed a rejection under 35 U.S.C. § 103, stating:

Because we do not discern any finding by the Board that there was a **suggestion, teaching, or motivation to combine** the prior art references cited against the pending



claims, the Board's conclusion of obviousness, as a matter of law, cannot stand. [Emphasis added]

Likewise, in the decision of *In re Lee*, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002), the court reversed another rejection under 35 U.S.C. § 103, stating:

This factual question of motivation is material to patentability, and could not be resolved on **subjective belief** and **unknown authority**. [Emphasis added]

This same decision also addressed the need for substantive evidence rather than general statements of obviousness (*Ibid.*, 1435):

Thus when they [the examiner and the Board] rely on what they assert to be general knowledge to negate patentability, that **knowledge must be articulated and placed on the record**. ... The board **cannot rely on conclusory statements** when dealing with particular combinations of prior art and specific claims, but must set forth the rationale on which it relies. [Emphasis and ellipsis added]

The conclusory statements presented regarding a suggestion or motivation to combine the disclosures of Luu and Mackey are insufficient to establish a *prima facie* case of obviousness. The Examiner has not provided any evidence of a motivation or suggestion to combine the references, either from statements in the references themselves or from other documentary evidence on the record.


A *prima facie* case of obviousness over Luu in view of Mackey has not been presented. There is no evidence on the record of any suggestion or motivation to combine the disclosures of the references. Moreover, the combination of the references, even if proper, fails to teach or suggest each and every element of the claims. Accordingly, Appellants' claims are not obvious under 35 USC § 103 over Luu or Mackey, alone or in combination.

### 3. Conclusion

The cited references, either alone or in combination, do not provide a valid basis for rejection of the present claims. Accordingly, Appellants submit that claims 1-7, 10-20 and 23-30 are fully patentable over Luu et al. (U.S. Patent No. 5,871,763) or Mackey et al. (U.S. Patent No. 5,705,164), alone or in combination, and the Examiner's rejection should be REVERSED.

Respectfully submitted,

4/30/03

  
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## APPENDIX A

Claims 1-7, 10-20 and 23-30 are pending.

1. A non-irritating anti-viral lotioned tissue product having applied to at least one surface thereof an anti-viral lotion composition comprising:
  - a virucidal effective amount of at least one anti-viral organic acid;
  - a topical delivery system including at least one polyester.
2. The lotioned tissue product of claim 1, wherein said lotion composition comprises from about 1% to about 25% of said anti-viral organic acid.
3. The lotioned tissue product of claim 2, wherein said at least one anti-viral organic acid comprises at least one member from the group consisting of carboxylic acids having the structure R-COOH, wherein R is a C<sub>1</sub>-C<sub>6</sub> alkyl; C<sub>1</sub>-C<sub>6</sub> alkyl carboxy; C<sub>1</sub>-C<sub>6</sub> alkyl carboxyhydroxy; C<sub>1</sub>-C<sub>6</sub> alkyl carboxy halo; C<sub>1</sub>-C<sub>6</sub> alkylcarboxy dihydroxy; C<sub>1</sub>-C<sub>6</sub> alkyl dicarboxyhydroxy; C<sub>1</sub>-C<sub>6</sub> alkenyl; C<sub>1</sub>-C<sub>6</sub> alkenyl carboxy; C<sub>1</sub>-C<sub>6</sub> alkenyl phenyl; or substituted phenyl radical.
4. The lotioned tissue product of claim 3, wherein one or more hydrogen atoms of R is substituted with a functional group selected from the group consisting of halogen atoms, hydroxyl groups, amino groups, thiol groups, nitro groups, and cyano groups.
5. The lotioned tissue product of claim 3, wherein said at least one anti-viral acid is selected from the group consisting of citric acid, malic acid, adipic acid, glutaric acid, succinic acid, and mixtures thereof.
6. The lotioned tissue product of claim 2, wherein said at least one polyester comprises a hydroxy-functional polyester diol.
7. The lotioned tissue product of claim 6, wherein said at least one polyester comprises trimethylpentanediol/adipic acid copolymer.

10. The lotioned tissue product of claim 1, wherein the lotion composition further comprises a surfactant.

11. A lotioned tissue product having applied to at least one surface thereof an anti-viral lotion composition comprising:

about 1% to about 25% of at least one anti-viral organic acid;

about 5% to about 25% of an emollient including at least one polyester;

and

a cationic surfactant.

12. The lotioned tissue product of claim 11, wherein said emollient comprises at least one polyester from the group consisting of fatty alkyl capped complex polyesters, hydroxy-functional polyester diols, and mixtures thereof.

13. The lotioned tissue product of claim 11, wherein said cationic surfactant comprises a quaternary ammonium compound.

14. A non-irritating, anti-viral lotion composition comprising:

a virucidal effective amount of at least one anti-viral organic acid; and

a topical delivery system including at least one polyester.

15. The lotion composition of claim 14, wherein said lotion composition comprises from about 1% to about 25% of said anti-viral organic acid.

16. The lotion composition of claim 15, wherein said at least one anti-viral organic acid comprises at least one member from the group consisting of carboxylic acids having the structure  $R-COOH$ , wherein R is a  $C_1-C_6$  alkyl;  $C_1-C_6$  alkyl carboxy;  $C_1-C_6$  alkyl carboxyhydroxy;  $C_1-C_6$  alkyl carboxy halo;  $C_1-C_6$  alkylcarboxy dihydroxy;  $C_1-C_6$  alkyl dicarboxyhydroxy;  $C_1-C_6$  alkenyl;  $C_1-C_6$  alkenyl carboxy;  $C_1-C_6$  alkenyl phenyl; or substituted phenyl radical.

17. The lotion composition of claim 16, wherein one or more hydrogen atoms of R is substituted with a functional group selected from the group consisting of halogen atoms, hydroxyl groups, amino groups, thiol groups, nitro groups, and cyano groups.

18. The lotion composition of claim 16, wherein said at least one anti-viral acid is selected from the group consisting of citric acid, malic acid, adipic acid, glutaric acid, succinic acid, and mixtures thereof.

19. The lotion composition of claim 15, wherein said at least one polyester comprises a hydroxy-functional polyester diol.

20. The lotion composition of claim 19, wherein said at least one polyester comprises trimethylpentanediol/adipic acid copolymer.

23. The lotion composition of claim 14, wherein the lotion composition further comprises a surfactant.

24. The lotion composition of claim 23, wherein said surfactant comprises a cationic surfactant.

25. A anti-viral lotion composition comprising:  
about 1% to about 25% of at least one anti-viral organic acid;  
about 5% to about 25% of an emollient including at least one polyester;  
and  
a cationic surfactant.

26. The lotion composition of claim 25, wherein said emollient comprises at least one polyester from the group consisting of fatty alkyl capped complex polyesters, hydroxy-functional polyester diols, and mixtures thereof.

27. The lotion composition of claim 26, wherein said cationic surfactant comprises a quaternary ammonium compound.

28. A method of inhibiting the transfer of a viral infection comprising:  
providing anti-viral lotion tissue product having applied to at least one surface thereof an anti-viral lotion composition comprising a virucidal effective amount of at least one anti-viral organic acid and a topical delivery system including at least one polyester;  
contacting a fluid containing at least one virus with said anti-viral tissue product; and  
absorbing said fluid within said absorbent article to contact the fluid with said anti-viral lotion composition.
29. The method of claim 28, further comprising:  
transferring a portion of the lotion composition to the user of the tissue product.
30. The method of claim 28, wherein said at least one polyester comprises a hydroxy-functional polyester diol.

## **APPENDIX B**

Manson, J.A. "Polyester resins" in *McGraw-Hill Encyclopedia Of Science & Technology*, 9<sup>th</sup> Edition, New York: McGraw-Hill., 2002, pp. 152-155.

occurs through copulation or hypodermic impregnation. The entolecithal eggs usually accumulate in the oviducts or uteri and after fertilization pass to the exterior through the vagina. Lang's vesicle, a bursa with a long stalk, is generally present. Müller's larva, the only free larval stage known in the Turbellaria, is found in some polyclads, but is lacking in most. This larva may indicate an evolutionary link between the Turbellaria and the Ctenophora, and between the Turbellaria and the Annelida.

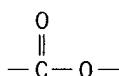
*Notoplana* and *Stylochus* (see *illus.*) are two of the largest and best-known genera of polyclads with representatives from both coasts of North America. In particular, species of *Stylochus* are often large forms 2 in. (5 cm) or more in length. See TURBELLARIA.

E. Ruffin Jones

Bibliography. H. G. Bronn (ed.), *Klassen und Ordnungen des Tierreichs*, vol. 4, 1930-1933.

## Polyester resins

Polymeric materials in which ester groups,



are in the main chains. The aliphatic polyesters tend to be relatively soft, and the aromatic derivatives are usually hard and brittle, or tough. The properties of either group may be modified by cross-linking, crystallization, plasticizers, or fillers.

The commercial products are alkyds, which are used in paints, enamels, and in molding compounds; unsaturated polyesters or unsaturated alkyds, which are used extensively with fiber glass for boat hulls and panels; aliphatic saturated polyesters; aromatic polyesters, such as polyethylene terephthalate which is used in the form of fibers and films; and the aromatic polycarbonates.

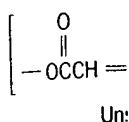
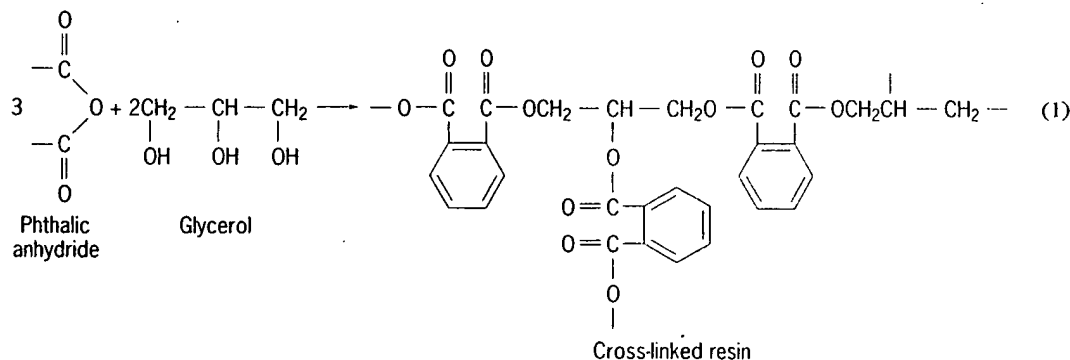
This article is devoted mainly to these four products. The polydiallyl esters are frequently listed with the polyesters and will be briefly mentioned. However, their polymers are not true polyesters as defined above. For a discussion of polyvinyl esters see POLYVINYL RESINS.

**Alkyds.** The alkyds have been in common use as coatings since World War I. In the beginning, they consisted almost entirely of the reactions products of *o*-phthalic anhydride and glycerol (glyptals), and pigment. Because the functionality of the system is greater than two, a cross-linked insoluble polymer is formed as in reaction (1). The fully cured product is quite hard and brittle. Flexible and tough materials can be produced by incorporation of monobasic acids or monohydroxy alcohols in proportions sufficient to increase flexibility but insufficient to prevent curing. Combinations of conventional vegetable drying oils and alkyd resins represent the basis of most of the oil-soluble paints. For example, by heating a mixture of dehydrated castor oil, the glycerol ester of linoleic acid, with suitable proportions of glycerol and phthalic anhydride, an oil-soluble polyester is formed. A common oil paint is produced by the addition of thinners, such as aromatic hydrocarbon solvents, a paint drier such as cobalt octoate, and pigments. By exposure to air in the presence of the paint dryer, the unsaturated diene groups of the linoleic ester polymerize to yield a tough, weather-resistant coating. See DRYING OIL.

The drying oil-alkyd described above may be further modified by the inclusion of a vinyl monomer, such as styrene, in the original esterification process. Some of the styrene polymerizes, probably as a graft polymer, and the remainder polymerizes and copolymerizes in the final drying or curing of the paint. Low-molecular-weight liquid condensates are useful as polymeric plasticizers for resins such as polyvinyl chloride. Molding components are also used for such applications as appliance housings and electrical components.

**Unsaturated polyesters.** The unsaturated polyesters were developed during and shortly after World War II. In combination with glass fiber, they found immediate applications as panels, roofing, radar domes, boat hulls, and protective armor for soldiers. Structural applications of this type continued to increase in importance over the years. The compositions are distinguished by ease of fabrication and high impact resistance. See POLYMERIC COMPOSITE.

A low-molecular-weight unsaturated polyester intermediate is first produced. The reaction of maleic anhydride with diethylene glycol, as shown in reaction (2), is typical. The product is a viscous oil of



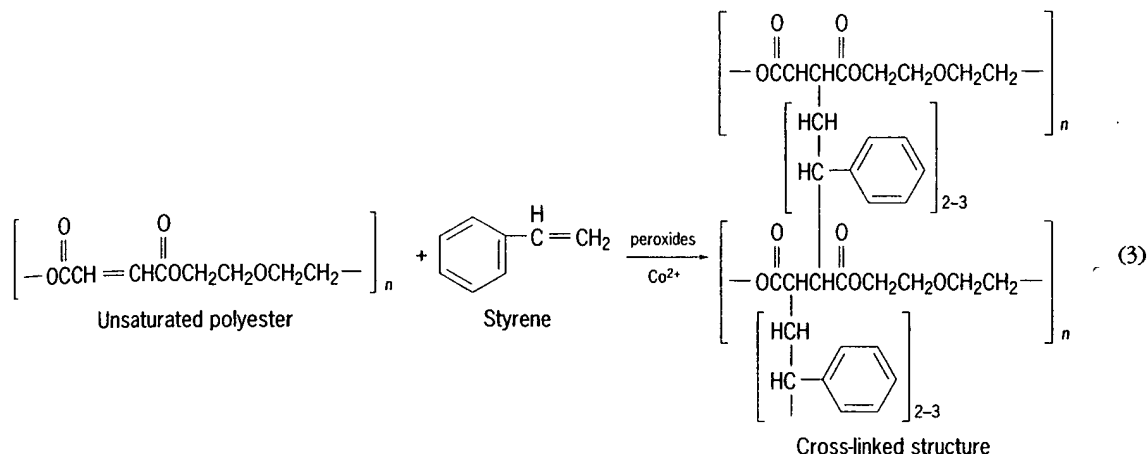
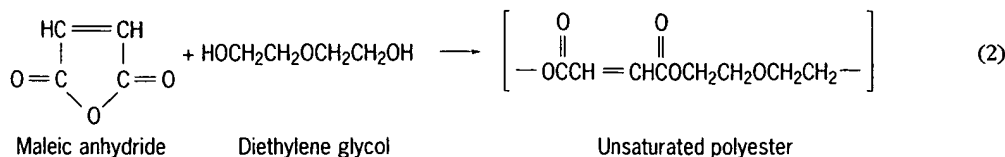
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molecular weight of 2000–4000. Many other acids (or anhydrides), such as fumaric acid, and glycols, such as propylene glycol, may be reacted together in a similar manner.

The low-molecular-weight unsaturated polyester will cross-link in the presence of a peroxide by copolymerization with styrene or other vinyl monomers. The unsaturated maleic group copolymerizes in essentially a 1:2 or 1:3 ratio with styrene. Therefore, several styrene molecules which react effectively join two ester chains together to yield an insoluble cross-linking structure, such as in reaction (3).

The commercially available intermediate unsaturated polyesters usually contain about 30% styrene or other vinyl monomer. On addition of a peroxide or other free-radical catalyst and a paint drier, the copolymerization starts. In this stage, the resin may be handled as a viscous fluid for a few minutes to a few hours, depending upon the activity of the catalyst. The viscous liquid may be applied to glass fiber (with a special surface treatment) in the form of matt, tow, roving, or cloth, with precautions to eliminate air bubbles and to avoid bubbles that may be caused by overheating as a result of too rapid curing. The surface of the glass fiber must have been given a special finishing treatment in advance for the polyester to adhere strongly. Glass fibers treated with a vinyl silane or an organochrome complex are commercially available.

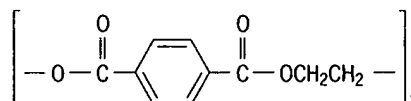
In the absence of the paint drier, oxygen of the air has an inhibiting effect on the curing process with the result that the surface of the product remains soft after the inner portions have hardened. In the presence of a paint drier, such as cobalt naphthenate, this skinning effect is eliminated.

A number of modifications of the composition described above have been made. Other acids, other

glycols, and various combinations may be used to vary properties, such as flexibility, of the final product. The chlorinated derivatives have higher resistance to burning. By varying the free-radical initiator, the optimum temperature required for curing may be varied. There are thermosetting molding compositions which have glass fiber as a filler, and a catalyst which is relatively inactive at ordinary temperatures. The mixture is cross-linked in the heated mold by the conventional process for thermosetting molding compounds.

**Saturated aliphatic polyesters.** Linear polyesters made by the condensation of a diacid such as adipic acid with a diol such as diethylene glycol have long been frequently used as intermediates in the preparation of prepolymers for making segmented polyurethanes. Lactone rings can also be opened to yield linear polyesters; poly-ε-caprolactone has been used as an intermediate in polyurethane technology, as a polymeric plasticizer for polyvinyl chloride, and in other specialty applications.

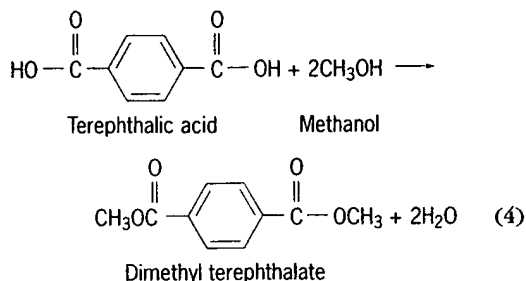
**Aromatic polyesters.** The aromatic polyesters which have achieved general importance are the polyethylene terephthalates, shown below, which



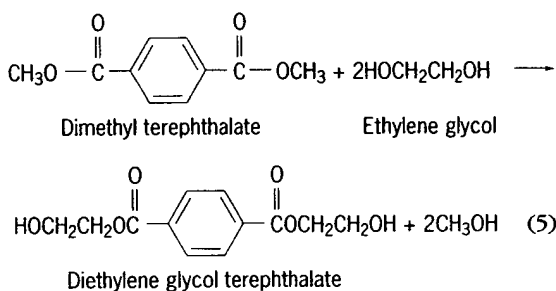
yield very strong and chemically resistant fibers and films. Polyethylene terephthalate is the principal ingredient of the polyester fibers that are available in the United States and in Europe.

The preparation of the polymer involves several steps. First, the dimethyl or diethylene glycol ester of terephthalic acid is produced and isolated,

reaction (4). Dimethyl terephthalate is then con-



verted to polyethylene terephthalate through ester interchange by heating with ethylene glycol in the presence of a catalyst, reaction (5). Further heat-



ing, under vacuum, of the condensate eliminates the methyl alcohol and any excess ethylene glycol and low-molecular-weight polymers, and results in the formation of high-molecular-weight, amorphous polyethylene terephthalate. If the diethylene glycol ester is utilized instead of the dimethyl ester, further heating under vacuum yields the polymer with the elimination of the excess ethylene glycol.

Ethylene glycol is obtained by the oxidation of ethylene and terephthalic acid by the oxidation of *p*-dialkyl benzenes such as *p*-xylene or *p*-cymene.

As first produced, the polymer is usually amorphous, but it readily crystallizes on reheating or on extension of the spun filaments or cast or extruded sheets. Polyethylene orthophthalate does not crystallize readily, nor does it yield useful fibers and films. Polyethylene terephthalate does crystallize readily, and has the very high crystalline melting point of 249°C (480°F).

The fiber is resistant to mildew and moths. It is used frequently in combination with cotton for clothing. Its chemical and heat resistance placed it in demand for sails and cordage. Thermoplastic molding compounds are used extensively to replace glass in nonreturnable beverage bottles.

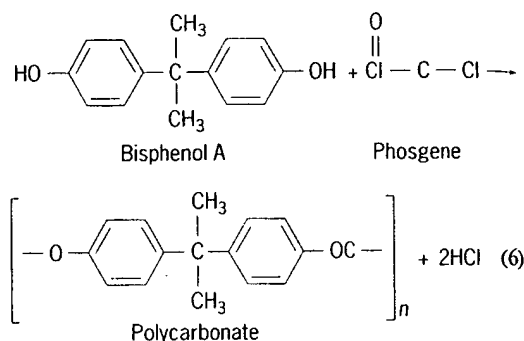
The film, which is stretched and oriented biaxially, is tough, strong, and insensitive to moisture. It is used for special packaging, as photographic film, in electrical transformers and capacitors, and in high-strength laminates. Useful films and fibers are also prepared using 1,4-cyclohexylene glycol as the glycol.

Other aromatic polyesters include polybutylene terephthalate, which may be molded or extruded to yield materials that can replace metals or thermoset resins in some automotive, electrical, and specialty

applications, especially when reinforced with glass fibers or mineral fillers. Several copolyesters have also been developed, as well as polyesters based on bisphenol A and isophthalic acid and on *p*-hydroxy benzoic acid. The last-mentioned polymer must be processed by metalforming techniques. Copolymers can be processed conventionally.

**Aromatic polycarbonates.** These are a strong, tough group of thermoplastic polymers formed most frequently from bisphenol A and phosgene. The products are noted for high softening temperatures, usually greater than 140°C (284°F), and high impact resistance, clarity, and resistance to creep.

Reaction (6), between bisphenol A and phosgene,



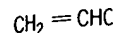
leads to the polycarbonate and the evolution of hydrogen chloride. Bisphenol A is obtained by the condensation of phenol and acetone, and phosgene is produced by the reaction of carbon monoxide with chlorine. The same type of polycarbonate can also be made by the ester interchange of diphenyl carbonate with bisphenol A.

As formed, the polymer is only slightly crystallized. It is believed that the toughness is due to a balance between high intermolecular attractive forces and local mobility of uncrystallized segments of molecules.

The polymer is usually available as a molding compound. Because of its high strength, toughness, and softening point, the resin, both by itself and as a glass-reinforced material, has found many electrical domestic and engineering applications. It is often used to replace glass and metals. Examples include bottles, unbreakable windows, appliance parts, electrical housings, marine propellers, and shotgun shells. Flame-retardant grades are of interest because of low toxicity and smoke emission on burning. Films have excellent clarity and electrical characteristics, and have been used on capacitors and in solar collectors, as well as in packaging.

**Polydiallyl esters.** These are polymers of diallyl esters, such as diallyl phthalate, diallyl carbonate, diallyl phenyl phosphonate, and diallyl succinate, in which cross-linked products are produced by polymerization of the allyl groups, as in the case of diallyl phthalate, reaction (7).

Thermosetting molding compounds may be produced by careful limitation of the initial polymerization to yield a product which is fusible. Then the polymerization and curing are completed

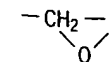
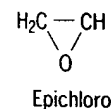


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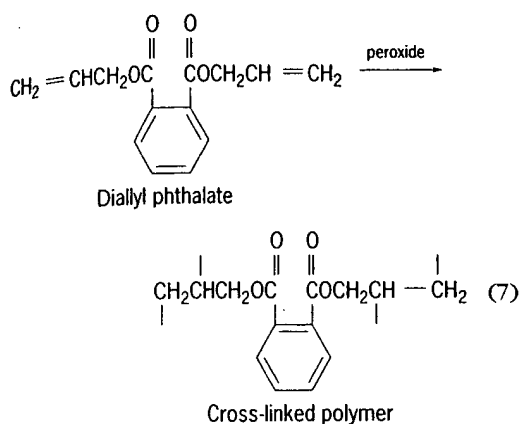
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in the final molding operation. Partially polymerized resins and the monomer are useful in making chemically resistant coatings. The monomer is often used as a cross-linking agent for polyester resins.

Major applications are in electronic components, sealants, coatings, and glass-fiber composites. See PLASTICS PROCESSING; POLYMERIZATION.

John A. Manson

### Polyether resins

Thermoplastic or thermosetting materials which contain ether-oxygen linkages,  $-\text{C}-\text{O}-\text{C}-$ , in the polymer chain. Depending upon the nature of the reactants and reaction conditions, a large number of polyethers with a wide range of properties may be prepared.

The main groups of polyethers in use are epoxy resins, prepared by the polymerization and cross-linking of aromatic diepoxy compounds; phenoxy resins, high-molecular-weight epoxy resins; polyethylene oxide and polypropylene oxide resins; polyoxymethylene, a high polymer of formaldehyde; and

polyphenylene oxides, polymers of xylenols.

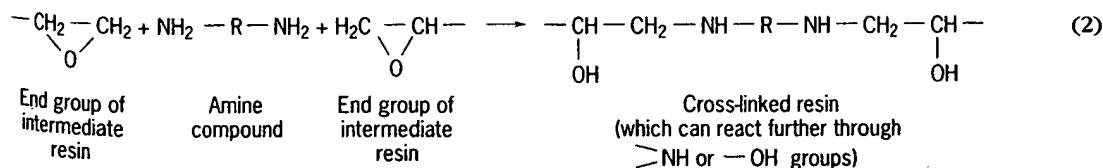
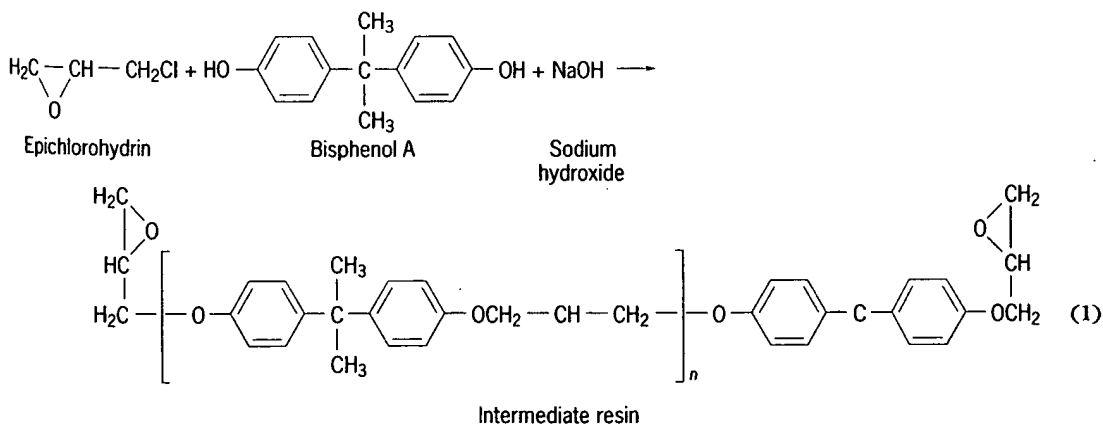
**Epoxy resins.** The epoxy resins form an important and versatile class of cross-linked polyethers characterized by excellent chemical resistance, adhesion to glass and metals, electrical insulating properties, and ease and precision of fabrication.

In the preparation of a typical resin, a low-molecular-weight diepoxy compound is first mixed with cross-linking agents, fillers, and plasticizers and then allowed to cure either at room temperature or with the application of heat.

The intermediate diepoxy compounds are condensation products of epichlorohydrin and aliphatic or aromatic diols and are available commercially. An example is the product of the reaction of epichlorohydrin with bisphenol A, reaction (1).

A wide variety of diols may be used in order to obtain a desired balance of properties. The liquid or solid intermediates obtained are quite stable, but do not have useful physical properties until they are polymerized further, by the addition of a curing or cross-linking agent, in a manner similar to addition polymerization. Polymerization may be initiated by catalysts such as boron trifluoride or tertiary amines. Alternatively, compounds containing a reactive hydrogen atom such as organic acids, alcohols, mercaptans, primary and secondary amines, and polyamides can also serve as catalysts. Reaction (2) represents this curing process with an amine compound. For special uses, polyols of greater functionalities are often used. These include epoxidized novalacs, epoxidized polyphenols, and glycidyl derivatives of amino-substituted aromatic compounds.

The type of curing agent employed has a marked effect on the optimum temperature of curing and has some influence on the final physical properties of the product. By judicious selection of the curing system, the curing operation can be carried out at almost any temperature from 0 to 200°C (32 to 390°F).



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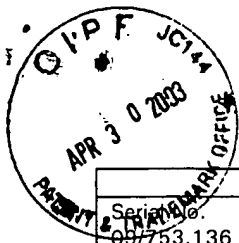
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| Serial No.<br>09/753,136  | Filing Date<br>December 29, 2000 | Examiner<br>Sharon L. Howard | Group Art Unit<br>1615 |
| Inventor(s)<br>Gary L. Shanklin et al.  |                                  |                              |                        |
| Title of Invention<br>Anti-Viral Lotion Tissue, And Methods For Making And Using The Same |                                  |                              |                        |

TO THE COMMISSIONER FOR PATENTS

Transmitted herewith is Appeal Brief (in triplicate) and return postcard.

- ☐ Small entity status of this application under 37 CFR § 1.27 has been established by verified statement previously submitted.
- ☐ Applicant claims small entity status. See 37 CFR 1.27.
- ☒ Petition for a one month extension of time.
- ☐ No additional fee is required.
- ☐ The fee has been calculated as shown below:

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|   |                                  |       |                                 |               | Small Entity    |           | Other Than Small Entity |           |
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|   | Claims Remaining After Amendment |       | Highest No. Previously Paid For | Present Extra | Rate            | Add'l Fee | Rate                    | Add'l Fee |
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- ☒ A check in the amount of \$110 to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this communication or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.
- ☒ I hereby petition under 37 CFR § 1.136(a) for any extension of time required to ensure that this paper is timely filed. Please charge any associated fees which have not otherwise been paid to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

4/30/03

  
Jonathan P. Taylor, Ph.D.  
Registration No. 48,338  
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